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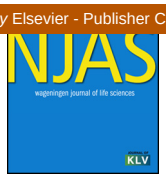

Mediation and moderation in food-choice models: a study on the effects of consumer trust in logo on choice

R. Zanoli[a,*], S. Naspetti[a], M. Janssen[b], U. Hamm[b]

[a] *Università Politecnica delle Marche*
[b] *University of Kassel*

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ABSTRACT

The paper introduces a way to analyse the influence of mediating and moderating variables on willingness to pay in a simple way. Using data on 427 Italian consumers regarding different organic logos, mediation and moderation analysis is applied for the first time in a discrete choice setting. We tested the hypothesis that trust in logo mediates the relationship between the logo and consumer choice for organic labelled food products. Results do not allow rejecting the hypothesis that trust in logo totally mediates the effect of the logo. Therefore, the willingness for organic products could be interpreted as "cost for trust": the higher the trust the higher the perceived value-for-money. The mediation effect of trust in logo does not vary across points-of-purchase or regions. Our novel approach is susceptible of various applications when analysing choice data and can be extended further.

1. Introduction

Mediation analysis is a means of testing hypothetical processes and mechanisms through which an independent variable, *Z*, might have an indirect effect over a dependent outcome variable, *Y*, through one or more *mediators*, *M*, sometimes called *intervening* or *process* variables [1–4].

Usually mediation analyses are applied in the framework of simple OLS multiple regression or other methods of estimation e.g. logit, multilevel modelling, and structural equation modelling (SEM) (among others: MacKinnon [5], Hayes [6], Hayes [7], Valeri & VanderWele [8]).

Moderation refers to the effects of a qualitative or quantitative variable "that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable" [2]. It is a very different concept from mediation. For example, gender differences may exist in the impact of, say, brand awareness on actual purchase intention. In this case, the variable gender interacts with the variable brand awareness in predicting the outcome of purchase intention. We say that gender is a *moderator* of the impact of brand awareness on purchase intention.

In this paper, we apply mediation and moderation analysis to discrete choice data to analyse the role of trust in logo in mediating willingness-to-pay (WTP) for organic labelled products, by adapting the original Baron & Kenny's [2] approach to discrete choice models[1]. We also investigate the moderating role of the point-of-purchase on this mediation, while accounting for regional variation.

Our results show that overall trust in the organic logo completely mediates consumers' choice of organic apples and eggs. In other words, since organic logos are cues to trustworthy organic quality, trust in these logos completely explains (causes) consumer choice and related WTP. This causality is moderated by the point-of-purchase, since exposure to (and awareness of) different logos varies in different types of shops. That trust in organic quality is a key factor in purchase decisions for organic products is not a new finding (see e.g. Naspetti & Zanoli [9]). The novelty of our analysis is to directly relate trust in logo with WTP, hence rendering the

[1] Recently, mediation researchers have criticized the original seminal work of Baron & Kenny [2] and focused more on the estimation of the indirect effect of M on Y [6]. These works criticize the "joint significance" approach of Baron & Kenny on the following grounds: a) its supposed low power in detecting the effect of the mediator variables, b) the fact that the indirect effect is not tested directly but "inferred logically by the outcome of a set of hypothesis tests" [6]. Some of these critiques have been retracted [12] and are not very relevant in our case, since in this paper we focus on the mediation effect (M→Y) and *not* on the indirect effect (X→M→Y).

* Corresponding author.
E-mail address: zanoli@agrecon.univpm.it (R. Zanoli).

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perceived product price as an indicator of "cost for trust". Dually, the more the trust embedded in a specific (organic) logo, the higher the perceived value for money. Given perceived customer value is a function of perceived benefits and perceived sacrifices [10,11], we believe that our findings are relevant since allow to directly relate a higher level benefit (trust) to an attribute (price), being logos (extrinsic attributes) just a visible cue of higher quality, which in turn increases the perceived value.

Finally, this paper introduces a way to analyse the influence of mediating and moderating variables on WTP in a simple way, using random parameter estimation or mixed logit model. Coefficient estimates for attributes that are fully mediated by other variables should, in principle, be zero. Moderation is handled by decomposing any heterogeneity observed within the random parameters.

The rest of the article is organised as follows. Section two describes the choice data. In section three we illustrate the method of investigation and the different types of models used for testing for mediation and moderation effects. Section four reports the results and their discussion, while the last section concludes.

Fig. 1. Choice experiment setting.

2. Data

We use partial data from the Janssen & Hamm's [13] survey that analysed the impact of different organic certification logos on consumer's WTP. This study focussed on 6 EU countries and two products (apples and eggs) and analysed how the logo choice is influenced by consumer awareness and perception of different organic logos and by consumer characteristics regarding the buying behaviour for organic food.

Choice experiments were conducted to elicit the WTP for different organic certification logos. In subsequent structured interviews, data was collected on factors that might influence consumers' WTP.

2.1.1. Choice experiment

The data we use here refer to the choice experiment in apples. Recruited participants needed to buy organic apples at least once per month. The choice of the product obviously influences the WTP, though the scope of our study was not to observe differences between the WTP in relation to the organic category, as in Krystallis and Chryssochoidis [14].

The hypothetical choice experiment was designed to resemble a real buying situation and to be incentive-compatible. Unlike in other studies with choice experiments (e.g. Loureiro & Umberger [15], Lockshin *et al.* [16], Lusk & Schroeder [17]), we used real organic apples instead of pictures or descriptions of products. Typical product information was shown on the price tag, which was identical across the alternatives (variety, domestic origin). Furthermore, the participants were paid a cash incentive and were instructed that they would have to pay for the chosen apples just like in a real shop to reduce the hypothetical bias [17]. For tax reasons, at the end of the choice experiment, the participants were informed that they could not be given the apples they had chosen and they could keep the money.

Each participant completed two choice sets for organic apples. Each choice set contained four products, which looked identically but were marked with different organic logos and prices (Figure 1). Four different organic logos were tested: three organic logos plus an alternative without a logo. In addition, the participants could also choose not to buy any of the offered alternatives ("no-buy option"). The no-buy option was included to make the buying decision more realistic. Furthermore, previous studies showed that forced choice might lead to biased results [18]. The logos where chosen to represent the most frequently available logos in all distribution channels (supermarkets and specialised organic shops); they where chosen on the basis of previous focus groups and a survey in retail shops. The old voluntary EU logo was used in the experiments, since the survey was conducted prior to the introduction of the new mandatory EU logo. The other logos used were CCPB (Certificazione e controllo prodotti biologici), the most common private organic certification logo in Italian supermarkets, and DEMETER, a worldwide private organic certification logo for biodynamic products. The logo awareness was specifically tested for by a means of Likert-type scale (1= completely unknown 7 = well-known, with awareness threshold rating above 4): the EU logo had an awareness of 83.4%, the other two logos lower (50.5% and 46.5% respectively, in the total sample). Indeed the CCPB logo is mainly found in brands sold in supermarkets (awareness; 51.9%), while the DEMETER one in specialised shops (awareness: 63.8%). Figure 2.

Four different price levels were tested. One month before the experiments were conducted, the average market price of organic apples/eggs was determined, based on which the tested prices were chosen (Table 1).

An orthogonal fractional factorial experimental design with 16 different choice sets was used for the systematic variation of the price levels across the organic labels. The sample was divided into eight blocks. Although it was not designed to minimize d-efficiency, the design was evaluated post-hoc using Ngene 1.1 (d-efficiency = 1.94).

Fig. 2. Choice sets with labels and prices.

Table 1
Price levels for apples in Euro/kg in the choice experiments.

Price		IT	
level	Ancona	Bari	Milano
-20%	2.33	2.14	2.58
Avg.	2.91	2.68	3.22
+20%	3.49	3.22	3.86
+40%	4.07	3.75	4.51

2.1.2. Structured interviews

The structured interviews conducted after the choice experiments contained the following questions:

1. Socio-demographic characteristics: gender, age, household size, level of education and net household income.
2. Consumer perceptions of the labels: The participants were asked to rate each of the three tested labels containing the logos regarding their level of trust and credibility. The answer categories are shown in Table 2.

The two items where summed up to build a scale, reflecting consumer 'overall trust in logo' (for simplicity we will label the overall scale TRUST). We recoded consumers as having a certain degree of TRUST all respondents who exhibited a rating higher than 4 in either of the two items. Therefore, the TRUST scale may have three values: 0 (the logo is considered neither trustworthy nor credible), 1 (the logo is considered either trustworthy or credible), 2 (the logo was rated both trustworthy and credible). The new TRUST scale is highly reliable (Cronbach's alpha: 0.88).

Data on 427 respondents were collected face-to-face in Italy in February and March 2010 after a pre-test with 15 participants one month earlier. The choice experiments were conducted in three different towns (Milan in the North, Ancona in the Centre and Bari in the South) at two kinds of shops/locations: conventional supermarkets and/or shopping centres and specialised organic food shops. Half of the choice experiments were conducted at each kind of shop, approximately reflecting the market share of each kind of shop in Italy, where organic market sales account for 1,550 Millions Euros and are mainly concentrated in the North and Centre [19]. In Italy, logos and labels nowadays play an increasingly important role alongside small (often specialised) retailing in achieving more accountable producer-consumer relations; until recently, small retailers and farmers' markets have occupied a dominant position while "supermarkets command a comparatively small fraction of the relatively high amount of trust placed in food" [20]. This is not only a characteristic of the organic food market: in Italy small and medium-sized farms are the vast majority and there is a strong presence of small specialized shops (groceries, bakeries, butcheries, etc.), open markets and farmers' markets, especially in the Centre and the South. This regional/point-of-sale differences obviously affect the consumers as well [21].

Table 2
Label ratings in the interviews.

Item	Interview question	Answer categories
Trust	Please rate each of the labels on the following scale.	Scale from 1 to 7 with: 1 = I completely trust this label. 7 = I do not trust this label at all
Credibility	Please rate each of the labels on the following scale.	Scale from 1 to 7 with: 1 = This label does not stand for real organic products. 7 = This label stands for real organic products. Additional category "I don't know"

Table 3
Description of the sample: Socio-demographic characteristics.

	IT
n	427
Gender	
n	427
Female	70.3%
Male	29.7%
Age	
n	427
18-44 years	42.4%
45-75 years	57.6%
Mean age in years	46.2
Education	
n	427
No formal qualification	0.0%
Middle school (min. 8 years of school)	1.6%
Secondary school (min. 12 years of school)	11.0%
College or university degree	87.4%
Household size	
n	426
mean	2.8
Household net income	
n	426
< 600 €	4.9%
600 € to <1,200 €	14.3%
1,200 € to <1,800 €	21.4%
1,800 € to <2,400 €	16.7%
2,400 € to <3,000 €	13.1%
3,000 € to <3,600 €	10.1%
3,600 € to <4,200 €	5.4%
4,200 € to <4,800 €	4.9%
4,800 € to <5,400 €	2.3%
5,400 € or more	6.8%

The socio-demographic characteristics of the sample are presented in Table 3. The level of education was generally high in the sample. However, this result is in accordance with previous studies suggesting that the share of people with a college or university degree is, on average, much higher among consumers of organic food compared to the rest of the population [22–24]. 70% of the respondents were female, reflecting the relationship of foodshoppers in Italy, where mainly women are responsible for food purchases. The mean household size was slightly above average compared to the population.

3. Model specification

In the mediation model of Baron and Kenny [2] the *direct effect* of Z on Y is noted as "Z→Y" and the *indirect effect* of X on Z through the mediator M as "Z→M→Y."

In our case, we can postulate that organic logos may enhance consumer trust toward organic food, which in turn may positively impact the WTP for organic food carrying those logos.

Following Becker [25] and Huffman *et al.* [26], consider the following utility function:

$$U = U(Q_1, Q_2, Q_3, \&, Q_i, \&, Q_{I-1}, Q_{NL}; T_1, T_2, \&, T_i, \&, T_{I-1}, T_{NL}) = U(Q, T) \quad (1)$$

Utility is based on preference of I choice variables: organic food labelled with various organic logos ($Q_1, Q_2, Q_3, \ldots, Q_{I-1}$), and with no logo ($Q_{NL}$). The utility of each choice is hypothesized to be affected by the level of trust associated to each of these logos ($T_1, T_2, \ldots, T_{I-1}, T_{NL}$).

The prices of organic food with logo (or no logo) are $p_1, \ldots, p_{I-1}, p_{NL}$.

At any time, consumers maximize their utility subject to the conventional linear budget constraint X:

$$Maximize\, U(Q,T)\, s.t. \sum_k p_k Q_k = X \tag{2}$$

Assuming strictly non-concave utility, we can form the Lagrangean equation for (2), that is

$$\phi = U(Q,T) + \lambda(X - \sum_k p_k Q_k) \tag{3}$$

The first order conditions are:

$$\frac{\partial U}{\partial Q_k} + \frac{\partial U}{\partial T_k} = \lambda p_k \,(for\ each\ k = 1, 2, \ldots, i,\ NL) \tag{4a}$$

$$\sum_k p_k Q_k - X = 0 \tag{4b}$$

Equation (4a) represents the basis for our mediation analysis, i.e. the assumption that price–opportunely scaled–should equate the sum of the marginal utilities of choice and of the trust on each logo.

Under the assumption of utility-maximization by n consumers facing I alternatives, consider the usual decomposition of the overall utility of each alternative i:

$$U_{ni} = V_{ni} + \varepsilon_{ni} \tag{5}$$

where ε_{ni} captures the factors that affect utility that are not included in V_{ni}.

In a labelled choice experiment, the linear-in-parameters representative utility is usually specified as:

$$V_{ni} = \alpha_i + x'_{ni}\beta \tag{6}$$

where, α_i represents a constant that is specific for alternative i, x_i is a vector of variables that relate to alternative i as faced by consumer n, and β are the coefficients of these variables.

If equation (1) holds, and we assume that the logos enhance consumer trust, we can therefore partition the vector x_{ni} and rewrite the representative utility to test the mediation effect:

$$V_{ni} = \alpha_i + z'_{ni}\gamma + \delta T_{ni} \tag{6'}$$

where α_i represents a constant that is specific for each alternative logo i, T_{ni} the measured levels of trust in the logo i for each consumer n, and z_{ni} the vector of remaining attributes of each alternative.

Given again the linear causal relationship in which the variable Z is presumed to cause the variable Y (Z→Y), a *moderator* variable (W)–usually a covariate–is a variable that alters the strength of the causal relationship (Baron & Kenny, 1986). When there is mediation, if W moderates the indirect effect of Z on Y through M, this means that mediation of the effect of Z on Y is moderated, something referred to as *moderated mediation*. *Mediated moderation*, instead, refers to the phenomenon in which the product of Z and a moderator of Z's effect (W) on Y carry its effect on Y through M [7]. In mediated moderation, the moderation disappears when the mediator is introduced. In moderated mediation, the pattern of mediation varies as a function of the moderator [4].

3.1. Basic model and WTP

Since only differences in utility matters [27], when different logos are involved the basic model in (6) may be specified as:

$$\begin{aligned} U_{nEU} &= ASC_{nEU} + \beta_n PRICE + \varepsilon_{nEU} \\ U_{nCCPB} &= ASC_{nCCPB} + \beta_n PRICE + \varepsilon_{nCCPB} \\ U_{nDEM} &= ASC_{nDEM} + \beta_n PRICE + \varepsilon_{nDEM} \\ U_{nNL} &= \beta_n PRICE + \varepsilon_{nNL} \\ U_{nNB} &= ASC_{nNB} + \varepsilon_{nNB} \end{aligned} \tag{7}$$

where the subscripts NL stands for No logo, and NB "No buy option", ASC_{ni} are the alternative specific constant (the NL is normalized to zero for identification), PRICE is the price in euros showed in each label (which is obviously zero in the Nb option).

The random parameter mixed logit model (MXL) for panel observations popularised by Train [28] obviates the limitations of preference homogeneity (all respondents as preference clones) and allows for the more realistic hypothesis of taste variation across respondents. In a mixed logit model the utility of individual i from alternative j is specified as:

$$U_{ij} = \beta'_i X_{ij} + e_{ij} \tag{8}$$

Where X_{ij} are observed variables that relate to each alternative and decision maker, β_i is a vector of coefficients for these variables for individual i representing that person's tastes, and e_{ij} is a random term.

In MXL specifications marginal WTP for each attribute of choice is calculated as the ratio of coefficients:

$$WTP = \frac{\beta(attribute\ level)}{\beta(price)} \tag{9}$$

This way of proceeding employs models specified on the "preference space", where often the price coefficient is held constant. This assumption makes the estimation easier but requires undesirable restrictions on the model, such a constant marginal utility of money.

Besides modelling taste heterogeneity in preference space–i.e. by specifying the distribution of coefficients in the utility function and then using them to derive the distribution of marginal WTP–we also estimated the model using the generalised mixed logit (GMXL) model by Fiebig et al. [29]. This model extends the random parameters "mixed" multinomial logit model (MXL) developed by Revelt and Train [30] and encompasses all types of multinomial logit models. We specified the model allowing for taste heterogeneity in all variables including the ASCs[2]. The GMXL model allows testing for scale heterogeneity, which was however not present in our data (τ=0,σ=1 as from Fiebig et al. [29]). The MXL model is, therefore, an adequate representation of our data.

However, the GMXL model can be simply re-parameterized such that the parameters are the WTP for each attribute rather than the utility coefficient of each attribute. That is, instead of the usual approach of parameterizing the model in 'preference space' (i.e., coefficients in the utility), the model is parameterize in 'WTP space' [31,32].

Since each respondent was presented two choices for each product, the model was estimated as panel data.

[2] This is accounted for by a subscript n in the ASCs.

Table 4
Results of the MXL & WTP-space models for organic apple choice (mediation analysis).

			Unmediated				Mediated			
			MXL		WTP-sp		MXL		WTP-sp	
Parameters	RP[a]	Coefficient	Estimate	|z-values|	Estimate	|z-values|	Estimate	|z-values|	Estimate	|z-values|
ASC EU logo	RP	μ	2.03	8.81	2.30	7.59	-0.02	0.06	0.21	0.62
		σ	2.33	6.20	1.79	4.28	1.89	5.77	1.56	5.55
ASC CCPB	RP	μ	1.17	5.40	1.29	4.36	-0.26	0.77	0.00	0.02
		σ	1.51	4.31	1.58	3.58	0.77	1.27	0.19	0.22
ASC Demeter	RP	μ	1.10	4.00	0.99	2.59	0.42	1.53	0.61	1.75
		σ	2.48	6.05	3.02	5.57	1.55	3.86	1.74	4.56
Price	RP	μ	-0.89	6.77	(-1.15)	(5.82)	-0.94	6.56	(-1.39)	(2.24)
		σ	1.13	4.59	(0.50)	(2.14)	1.27	5.10	(0.58)	(1.60)
ASC No-buy	NR	μ	-9.84	6.11	7.13	5.43	-11.68	5.95	11.10	1.55
TRUST	RP	μ	–		–		1.75	8.15	1.87	7.43
		σ	–		–		1.25	5.51	1.43	6.95
Nr. parameters			9		9		10		10	
Final Log Likelihood			-981.45		-986.06		-892.91		-898.38	
Adj. Pseudo R^2			0.29		0.28		0.35		0.35	
AIC			1980.9		1992.1		1807.8		1820.8	
Nr. observations			854		854		854		854427	
Nr. individuals			427		427		427			

–Term was not estimated in the model. The terms in brackets are the coefficients and std. deviations of price in preference space form.
Since each respondent performed two choices, the number of observations is twice the number of respondents.
[a] 'RP' stands for random parameters, 'NR' stands for non-random (fixed) parameters.

3.2. Inference on Mediation

In order to test that the TRUST variable has mediating effects on the choice, we refer to Baron and Kenny [2] stepwise procedure:

Step 1: Show that logos affect the choice. This step establishes that there is an effect that may be mediated. This may be established by estimating the model specified in (7).

Step 2: Show that the causal variables (the logos and the price) are correlated with the mediator TRUST. This step is usually performed by regressing the mediator over the independent variables, X. In our discrete choice context, this test was performed by substituting actual choice with TRUST in the equations (7)[3] (Train [33], p.6) [4].

$$\begin{aligned} TRUST_{EU} &= ASC_{EU} + \beta_{PRICE} PRICE + \varepsilon_{EU} \\ TRUST_{CCPB} &= \beta_{PRICE} PRICE + \varepsilon_{CCPB} \\ TRUST_{DEM} &= ASC_{DEM} + \beta_{PRICE} PRICE + \varepsilon_{DEM} \end{aligned} \quad (10)$$

Note that, since TRUST is only rated for the three logos, neither the NL nor the NB utilities were estimated. Therefore, one of the ASC could not be identified and we dropped ASC_{CCPB} from the respective equation.

Step 3: Show that the mediator affects the choice, while controlling for the effects of the logos. To test this, we need to estimate the augmented model (6′), which may be specified as:

$$\begin{aligned} U_{EU} &= ASC_{EU} + \beta_{PRICE} PRICE + \delta_{TRUST} TRUST + \varepsilon_{EU} \\ U_{CCPB} &= ASC_{CCPB} + \beta_{PRICE} PRICE + \delta_{TRUST} TRUST + \varepsilon_{CCPB} \\ U_{DEM} &= ASC_{DEM} + \beta_{PRICE} PRICE + \delta_{TRUST} TRUST + \varepsilon_{DEM} \\ U_{NL} &= \beta_{PRICE} PRICE + \varepsilon_{NL} \\ U_{NB} &= ASC_{NB} + \varepsilon_{NB} \end{aligned} \quad (7')$$

Again, note that, since TRUST is only rated for the three logos, the variable does appear in neither the NL nor the NB utilities.

Step 4: To establish that 'overall trust on logo' completely mediates the logo-choice relationship, the effect of logos on choice controlling for TRUST should be zero. In other words, if *complete mediation* takes place, the ASC coefficients should be zero, while if *partial mediation* takes place, the coefficients of the ASC should be reduced compared to the ones estimated in Step 2.

3.3. Moderation analysis

To test the hypothesis that the mediation effects are not moderated by other measured covariates, we have interacted the potential moderator variables (covariates) with the random parameters (ASC coefficients, PRICE, and TRUST). Doing this in effect decomposes any heterogeneity observed within the random parameter, offering an explanation as to why that heterogeneity may exist [34]. Besides, we conducted the same analysis in the unmediated case too, to check for simple moderating effects of these covariates over choice. If moderation exists in the unmediated model and then disappear in the mediated one, we can speak of mediated moderation. Instead, we are observing a moderated mediation model if mediation is moderated by covariates, i.e. mediation is stronger for one group (e.g. males) than for another (e.g. females).

Table 5
Results of the MXL model for TRUST.

Parameters	RP[a]	Coefficient	MXL Estimate	|z-values|
ASC EU logo	NR	μ	0.32	40.97
ASC Demeter	RP	μ	-0.91	69.20
		σ	1.37	84.19
Price	NR	μ	0.01	1.41
Nr. parameters			4	
Final Log Likelihood			-3422.77	
Adj. Pseudo R^2			0.06	
AIC			6853.5	
Nr. observations			838	
Nr. individuals			427	

Since each respondent performed two choices, the number of observations is twice the number of respondents less missing observations.
[a] 'RP' stands for random parameters, 'NR' stands for non-random (fixed) parameters.

[3] For simplicity, in this and the following equations we have removed the subscript *n*
[4] TRUST being a count variable is modelled as frequency data.

Table 6
Results of the MXL models for organic apple choice (moderation analysis).

			Unmediated		Mediated	
Parameters	RP[a]	Coefficient	Estimate	|z-values|	Estimate	|z-values|
ASC EU logo	RP	μ	2.19	3.61	0.38	0.89
		σ	2.21	6.12	1.85	5.66
ASC CCPB	RP	μ	.17	0.30	-0.08	-0.2
		σ	1.59	4.08	0.50	0.68
ASC Demeter	RP	μ	1.41	2.20	0.78	1.95
		σ	2.37	6.19	1.40	3.84
Price	RP	μ	-1.02	3.18	-0.93	6.67
		σ	1.09	4.44	1.22	5.08
ASC No-buy	NR	μ	-9.76	6.10	-10.40	6.45
TRUST	RP	μ	–	–	1.67	6.31
		σ	–	–	1.27	5.43
SHOP X ASC EU	HM	μ	-0.34	0.82	-0.54	0.96
SHOP X ASC CCPB	HM	μ	0.47	1.44	-0.02	0.04
SHOP X ASC Demeter	HM	μ	-1.39	2.95	-0.46	0.95
TOWN X ASC EU	HM	μ	0.02	0.09	–	–
TOWN X ASC CCPB	HM	μ	0.36	1.44	–	–
TOWN X ASC Demeter	HM	μ	0.20	0.70	–	–
SHOP X Price	HM	μ	0.05	0.24	–	–
TOWN X Price	HM	μ	0.04	0.32	–	–
SHOP X TRUST	HM	μ	–	–	0.03	0.12
Nr. parameters			17		15	
Final Log Likelihood			-970.32		-892.76	
Adj. Pseudo R^2			0.29		0.35	
AIC			1974.6		1815.5	
Nr. observations			854		854	
Nr. individuals			427		427	

–Term was not estimated in the model.
Since each respondent performed two choices, the number of observations is twice the number of respondents.
[a] 'RP' stands for random parameters, 'NR' stands for non-random (fixed) parameters, 'HM' stands for heterogeneity in mean parameter.

4. Results

4.1. Testing for Mediation

Table 4 reports MXL (preference-space) and GMXL (WTP-space) model estimation results for apples, both estimated using 200 Halton draws. All models allow for a constant fixed effect for the no-buy alternative, while all random parameters are assumed to be normal. The WTP space model parameters are already WTP estimates. In the first two columns from the left in Table 4 the unmediated model results specified by (7) are reported. These refer to Baron and Kenny's [2] Step 1. In the remaining two columns on the right the results of Baron and Kenny's Steps 3 and 4 are reported, as specified in (7′).

All ASC parameters reported in Table 4 for both MXL (preference space) and WTP-space *unmediated* models are highly significant, showing the role of logos in explaining consumer preferences of organic apples. All standard deviation parameters are also highly significant, which is consistent with the hypothesis of taste heterogeneity. The WTP-space estimates are substantially similar to those that may be calculated by the unconditional parameter estimate in the MXL specification by taking the ratio of each ASC parameter estimate and the absolute value of the price parameter estimate[5]. They represent the additional WTP with respect to the 'No Logo' label (reference alternative). As found in previous studies [13,35], the EU logo was highly regarded by Italian consumers as a means to guarantee organic food products. The other logos are lesser known, and in general score a lower additional WTP.

In Table 5 we report the MXL results of regressing TRUST over logos ASC and price (Baron and Kenny's Step 2), estimated using 200 Halton draws. All random parameters are assumed to be normal. Since estimated standard deviations of EU ASC and price were found to be insignificant in restriction tests, they were restricted to zero, implying fixed coefficients and an absence of heterogeneity. Not all respondents rated the logos for trustworthiness and credibility, resulting in 14 missing observations.

The results reported in Table 5 show that indeed the overall TRUST in the logo is significantly correlated with the logo itself. The EU logo is the one that exhibits higher trust, with no apparent heterogeneity among Italian respondents, while the Demeter logo–on average–is negatively correlated with trust (it is well-known only by a minority of respondents: see Janssen and Hamm [13]). Overall model fit is low, since this is not a fully specified model of TRUST and is only used to establish the relationship between TRUST and the explanatory variables (logo ASCs and price) in the labelled choice model.

These results are further confirmed by the results of the mediation analysis reported in the last two columns of Table 4. Once the variable TRUST is accounted for in the models, the ASC parameter estimates become non-significant (i.e. zero)[6], both in the preference-space and the WTP-space models. Notably the standard deviations of parameters remain significant (with the exclusion of the CCPB ASC in the preference space model), showing that consumers exhibit taste heterogeneity and the parameters are distributed normally around zero.

The model does not reject the hypothesis of *complete mediation* of the logo effects on choice through the TRUST variable. This effect

[5] These, for the unmediated MXL model are: EU 2.27€, CCPB 1.30€, Demeter 1.23€.

[6] Kenny, in his mediation website [4], warns that the coefficients should be zero in value, and not simply statistically non-significant, as they were in Baron and Kenny [2], "because trivially small coefficients can be statistically significant with large sample sizes and very large coefficients can be non-significant with small sample sizes". However, in our choice model the TRUST variable may suffer of endogeneity and this would result in inconsistent (but not inefficient) estimates of b and c': since the sample size is large, and we have estimates of both the parameters (which are nonsignificant) and of the standard deviations of the parameter distributions (which instead are highly significant), we can be fairly confident in our conclusions regarding complete mediation.

is shared by all logos, though it is clear that the highest effect is on the EU logo, which exhibited the highest WTP. In other words, it appears from Table 4 that consumers' trust in logo is completely entangled with the *logo* itself. Indeed the organic logo is an extrinsic cue for the (organic) quality of the product (in our case, apples or eggs).

4.2. Testing for Moderation

We have tested the moderation effect of two covariates: SHOP & TOWN. The first is a dichotomous variable (0 = specialised organic shop, 1 = conventional supermarket. The latter is a categorical variable referring to where interviews where collected (Northern, Central, and Southern Italian towns).

Since TOWN was not significant as moderator in the unmediated model, we have run the mediated moderation analysis only with the variable SHOP as moderator. Table 6 report the results of our estimations in preference space.

In the unmediated model, SHOP appears to be a significant moderator for the Demeter logo. Indeed, as we have already mentioned, this logo is more frequently seen in specialised organic shop (and consumers buying in those shops are more aware of it). The negative sign in the interaction term means that the marginal utility of Demeter logo is higher for those buying in the specialised shop.

However, once logos are mediated by TRUST, SHOP stops to explain preference heterogeneity in Demeter logo ASCs: the moderation effect of SHOP is mediated, too. In other words, trust in logo explains (causes) the choices (and relative WTPs), notwithstanding the kind of point-of-purchase the logo are found. We can conclude that the mediation effect of trust in logo does not vary across points-of-purchase or regions.

5. Discussion and Conclusions

In this paper, we have shown how mediation and moderation analysis can be simply integrated in a discrete choice setting. By our novel approach, one can test the role of mediating and moderating variables on consumer choice and related WTP, using a general framework to model preference heterogeneity, i.e. without imposing unrealistic constraints on the model.

Specifically, our study tested the hypothesis that trust in the (organic) logo mediates the relationship between the logo and consumer choice (and related WTP) for organic labelled food products. Our findings confirm the fact that trust in logo plays a major role in consumers' choice of organic apples (and eggs), and that the reason lays in that the logos are perceived as cues to trustworthy organic quality [35,36]. Trust is a multidimensional concept [37], which facilitates and positively influences consumers purchase intentions and choices [38]. In the case of food, it is an essential element for decision-making and is directly related with food safety perceptions [39,40]. Consumers perceive organic logos as an important source of trust [41,42], while Zanoli & Naspetti [43] have shown that trust in logo is directly associated with consumers motivations to purchase organic food. Using our approach, since trust in logo totally mediates the effect of the logo, WTP for organic products could be interpreted–given (9)–as "cost for trust", since trust totally mediates the logos (ASCs). In other words, trust embedded in the logos fully explains ("causes", in mediation sense) WTP, and the higher the trust the higher the perceived value-for-money. Therefore, consumers' perceived acceptable price or *internal reference price* [44] is dependent on trust in logo; although this price may vary across points-of-purchase and/or regions, the mediation effect of trust in organic logo–as we have proven–does not.

We believe that the findings of our study have implications that go beyond our limited experiment on organic logos. Using our approach one can easily test the effect of brand image (as embedded in logos but also in brand names) on choice and WTP, by using trust as mediator. But the approach is susceptible of further extensions, when investigating the impact of mediating/moderating variables on WTP.

The advantage to use our approach is that choice experiments allow a rigorous–albeit very realistic–investigation of how consumer choices are made (*rectius* stated) given hypothetical situations. For example, Laran et al. [45] tested the diverse priming role of brands and slogans on WTP. Their study was performed using a simple ANOVA approach to analyse the effect of the persuasive intent of different stimuli (slogans, sentences, brand names and logos) on WTP[7]. The stimuli and the WTP where measured in separate, subsequent experiments. The WTP–given each stimulus–was measured in a way not consistent with utility maximization. In a discrete choice setting, their mediation and moderation analyses would have benefitted of a rigorous representation of utility based on a set of attributes (the different stimuli) and their levels (the persuasive intent), while allowing a direct measure of WTP.

Further extensions of our model may consider the use of "structural choice modelling" [46], an approach that integrates choice models and structural equation models, and allows combining data from separate but related choice experiments.

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